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# Contingent Valuation Methodology in the Natural Resource Damage Regulatory Process: Choice Theory and the Embedding Phenomenon

## ABSTRACT

*In their most recent article on the use of Contingent Valuation Methodology ("CVM") in the natural resource damages assessment ("NRDA") process, the authors take issue with the CVM components of the National Oceanic and Atmospheric Administration's ("NOAA") proposed NRDA rules. In particular, the authors argue that NOAA's proposed NRDA process does not comport with basic tenets of choice theory and that the CVM safeguards created by NOAA are not adequate to address the inherent, and perhaps irreconcilable, flaws in CVM assessments. To illustrate their arguments, the authors examine and criticize NOAA's treatment and general disregard of the embedding phenomenon. The author's argue that the existence of the embedding phenomenon in CVM valuations demonstrates the inappropriateness of CVM as a regulatory tool in the NRDA process.*

## I. INTRODUCTION

The use of Contingent Valuation Methodology ("CVM") to quantify natural resource damages claims under the Comprehensive Environmental Response Liability Act ("CERCLA")<sup>1</sup> and the Oil Pollution Compensation and Act of 1990 ("OPA")<sup>2</sup> has engendered a storm of

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1. 42 U.S.C. §§ 9601-9675 (1982 & Supp. V 1987). CERCLA, § 9607(a)(4)(C), creates a cause of action for "damages for injury to, destruction of, or loss of natural resources, including the reasonable costs of assessing such injury, destruction, or loss resulting from such a release [of hazardous substances]. . . ."

2. 33 U.S.C. § § 2701-2761 (Supp. 1993). Similar to CERCLA § 9607(a)(4)(C), OPA § 2702(b)(2) creates a cause of action for natural resource damages resulting from a discharge

regulatory debate,<sup>3</sup> perhaps more intense than has previously been directed at any social science or economic method in any legal context. The complexity of the debate is evidenced by the collection of articles published in the 1994 *Natural Resources Journal*<sup>4</sup> CVM Symposium. As demonstrated by the Symposium, economic and legal experts in the field embrace widely divergent opinions regarding whether CVM is a highly insightful, innovative technique that allows for the quantification of previously unquantifiable public natural resource non-use values or, instead, is an economic and social science aberration, lacking reliability, trustworthiness, and a theoretically defensible foundation, which is good for little more than creating inflated damage claims intended for leveraging disproportionate settlements.<sup>5</sup>

Professors Ronald G. Cummings and Glenn W. Harrison, experts in the use and misuse of CVM, describe both the method and the problem in a more evenhanded fashion in their Symposium article, as follows:

The CVM involves the use of surveys describing the good or resource injury to be valued, a rule that relates financial payments to the provision of the good or the avoidance of the injury, and a question that asks the subject to report a maximum willingness to pay (WTP) some amount of money to see the good provided or the injury avoided. Both the "good" and the subject's payment are hypothetical. These features of the CVM, particularly hypothetical payment, are the source of concern over the extent to which values derived using this method actually reflect real economic commitments in any precise way.<sup>6</sup>

CVM has been criticized as embodying a number of fatal flaws, including inherent strategic and behavioral biases, inappropriate and skewed survey methods and analyses, and informational and sensitivity inadequacies.<sup>7</sup> While the authors believe these concerns are real and

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of oil "into or upon the navigable waters or adjoining shorelines or the exclusive economic zone . . . ." *Id.* § 2702(a).

3. For a comprehensive discussion of the development of the CVM debate, see Brian R. Binger, Robert F. Copple, and Elizabeth Hoffman, *The Use of Contingent Valuation Methodology in Natural Resource Damage Assessments: Legal Fact and Economic Fiction*, 89 NW. L. R. 1029 (1995), *passim*. For a discussion of how CVM-based valuations are then used to calculate natural resources damage claims, see Robert F. Copple, *The New Economic Efficiency in Natural Resource Damage Assessment*, U. Colo. L. Rev. (forthcoming 1995).

4. Symposium, Estimating CERCLA Damages, 34 Nat. Resources J. 1 (Winter 1994).

5. See generally, Binger, Copple, & Hoffman, *supra* note 3.

6. Ronald G. Cummings & Glenn W. Harrison, *Was the Ohio Court Well Informed in its Assessment of the Accuracy of the Contingent Valuation Method?*, 34 Nat. Resources J. 1, 2 (1994).

7. For a sampling of the more significant CVM literature, see generally, *id.*; *Contingent*

serious, even correcting for these flaws—a task that may very well be impossible—CVM suffers from a more serious and fundamental flaw in that the method does not elicit willingness-to-pay ("WTP") bids that are consistent with the tenets of choice theory. As such, CVM is incapable of producing results that are sufficiently trustworthy to support natural resource damage claims or judgments. Further, it is highly unlikely that any amount of methodological refinement will provide a fix for those flaws and allow for the actual capture of real and accurate natural resource values.

While the choice theory issues raised by CVM are numerous and varied, the authors assert that the failure of CVM to comport with tenets of choice theory can be demonstrated by focusing on the "embedding phenomenon" inherent in CVM assessments.<sup>8</sup> The embedding phenomenon is a psychological survey effect whereby, when respondents are asked to value or state their ("WTP") for a target commodity, i.e., the continued existence of the whooping crane, WTP valuations will vary significantly depending on whether respondents are asked to value the target good alone or as a subset of other public goods i.e., all public environmental goods, all wildlife, whooping cranes. Such discrepancy between bids for the target good because of the bundling of the target good with other public goods is inconsistent with choice theory, under which the valuation of the target good should remain constant regardless of whether it is presented as a subset of, or bundled with, other environmental goods.<sup>9</sup>

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*Valuation: A Critical Assessment* (Jerry A. Hausman, ed., 1993) (hereinafter *Hausman*): Ronald G. Cummings, et al., *Valuing Environmental Goods: An Assessment of the Contingent Valuation Method* (1986); Robert C. Mitchell & Richard T. Carson, *Using Surveys to Value Public Goods: The Contingent Valuation Method* (1989); *The New Rules for Natural Resource Damage Assessments and Claims Under CERCLA and OPA 480-617* (Linda Burlington & William S. Roush, Jr. eds., 1994); *Valuing Natural Assets: The Economics of Natural Resource Damage Assessment* (Raymond J. Kopp & V. Kerry Smith eds., 1993); Kevin M. Ward & John W. Duffield, *Natural Resource Damages: Law and Economics* 281-350 (1992); Christine Augustyniak, *Economic Valuation of Services Provided by Natural Resources: Putting a Price on the Priceless*, 45 *Baylor L. Rev.* 389 (1993); Richard Carson & Peter Nararro, *Fundamental Issues in Natural Resource Damage Assessments*, 28 *Nat. Resources J.* 815, 816-17 (1988); Jeffrey C. Dobbins, *The Pain and Suffering of Environmental Loss: Using Contingent Valuation to Estimate Nonuse Damages*, 43 *Duke L. Rev.* 879 (1994); Carl V. Phillips and Richard J. Zeckhauser, *Contingent Valuation of Damage to Natural Resources: How Accurate? How Appropriate?*, 4 *Tox. L. Rep.* 520, 528 (1989); Note, "Ask a Silly Question . . .": *Contingent Valuation of Natural Resource Damages* 105 *Harv. L. Rev.* 1981 (1992);

8. The embedding phenomenon in CVM is addressed more fully in a study set out in Binger, Copple, & Hoffman, *supra* note 3, § III.

9. For a more comprehensive description of the embedding phenomenon, see *infra* III; Binger, Copple, & Hoffman, *supra* note 3, § III.

Within the regulatory literature<sup>10</sup>, the "embedding phenomenon" was first identified by a blue ribbon economics panel assembled by NOAA,<sup>11</sup> where it was the centerpiece of the Panel's concerns regarding the reliability and accuracy of CVM in the natural resource damages context. However, as NOAA began to develop its protocols for the use of CVM in quantifying natural resource damages associated with oil spills, the embedding phenomenon was off-handedly dismissed with little discussion of its relevance to rational choice concerns.<sup>12</sup> Contrary to the NOAA rulemakers' conclusions, the authors assert in this article that concerns regarding the effect of the embedding phenomenon on CVM-based natural resource damages claims have not been adequately addressed by NOAA and its proposed CVM protocols. Accordingly, the embedding phenomenon remains as a real and substantial weakness in CVM assessments of natural resource damages. The following discussion is presented in two parts. First, the authors describe the regulatory status of the embedding phenomenon within the development of natural resource damages regulations governing the use of CVM. Second, the authors explain why, as a matter of economic choice theory, the embedding phenomenon casts great doubt on the inherent reliability of CVM in the natural resources context.

## II. EMBEDDING PHENOMENON IN THE REGULATORY CONTEXT

While NOAA was not the first Federal agency to address the use of CVM in the natural resource damages assessment process,<sup>13</sup> it was

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10. The U.S. Department of Interior ("DOI"), under authority granted to it by CERCLA, and the National Oceanic and Atmospheric Administration, pursuant to OPA, are the two federal agencies most actively involved with the promulgation of natural resource damage regulations, and accordingly, with the CVM component of the resulting regulatory schemes. For a comprehensive discussion of the DOI and NOAA rulemaking efforts in the CVM context, see Binger, et al., *supra* note 3, at § II.

11. See National Oceanic and Atmospheric Administration, Advanced Notice of Proposed Rulemaking, Extension of Comment Period and Release of Contingent Valuation Methodology Report, 58 Fed. Reg. 4601 (1993) [hereinafter *NOAA Report*].

12. See *infra* note 50 and accompanying text.

13. DOI has been involved in an extensive series of ongoing rulemakings which, in part, address and continue to struggle with the use of CVM to quantify natural resource damages. In 1986, DOI issued its final rule, Department of Interior, Natural Resource Damage Assessments, 51 Fed. Reg. 27,674 (1986) (*codified at* 43 C.F.R. pt. 11), which was challenged and invalidated in part in *State of Ohio v. Department of the Interior*, 880 F.2d 432 (D.C. Cir. 1989). On remand, DOI issued a proposed rule to address the Court's concerns, relating, in particular to nonuse values and methods for their quantification. Department of Interior, Natural Resource Damage Assessments, Notice of Proposed Rulemaking, 56 Fed. Reg. 19,752 (1991). After the change of Presidential administrations,

responsible for the first regulatory identification of the embedding phenomenon as a potential CVM flaw. In 1993, NOAA's CVM study panel ("NOAA Panel"), charged with the task of determining whether the "technique is capable of providing reliable information about lost existence or other passive-use values," issued a detailed set of findings and recommendations regarding the application of CVM to natural resource damage assessments.<sup>14</sup>

Noting that "[t]he contingent valuation method has been criticized for many reasons and the Panel believes that a number of these criticisms are particularly compelling,"<sup>15</sup> the Panel identified the following concerns as being of particular importance to the Panel's analysis:<sup>16</sup>

1. "The contingent valuation method can produce results that appear to be inconsistent with rational choice . . ."<sup>17</sup>  
In explaining the rational choice concerns, the NOAA Panel noted that CVM study results tend to demonstrate an inconsistency among the choices made by individuals in that willingness-to-pay bids do not appear to consistently increase or decrease with corresponding increases or decreases of the quantity of the good in question. For example, the NOAA Panel cited one study that demonstrated that total willingness-to-pay was not significantly different for scenarios seeking bids to protect 2,000, 20,000 or 200,000 non-endangered migratory birds of the same species. Under choice theory, there should have been significant variation between the groups of bids

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DOI reopened the comment period on the proposed rule and provided additional discussion of natural resource damage assessments, with particular emphasis on issues relating to the use of CVM. Department of Interior, Natural Resource Damage Assessments, Proposed Rule, Reopening of Comment Period, 58 Fed. Reg. 39,327 (1993). Final regulations were officially promulgated in 1994. Department of the Interior, Natural Resource Damage Assessments, Final Rule, 59 Fed. Reg. 14,262 (1994) (to be codified at 43 C.F.R. pt. 11). Issues concerning CVM and the quantification of nonuse values are presently the subject of a separate DOI rulemaking. Department of the Interior, Natural Resource Damage Assessments, Notice of Proposed Rulemaking, 59 Fed. Reg. 23,098 (1994).

14. NOAA Report, *supra* note 11, at 4603.

15. *Id.*

16. *Id.* at 4604. It is important to emphasize that the concerns and criticisms outlined below were specifically identified by the NOAA Panel. As such, those criticisms are set out here for the purpose of describing the NOAA CVM regulatory history and not as a definitive statement regarding CVM. The authors' note that the area of CVM criticism is a wide open field. As such, the authors are presently conducting further CVM research that, when completed, may provide a different perspective on the concerns identified by the NOAA Panel.

17. *Id.*

based on the different quantities of birds (units) in each scenario.<sup>18</sup>

2. "[R]esponses to CVM surveys sometimes seem implausibly large in view of the many programs for which individuals might be asked to contribute and the existence of both public and private goods that might be substitutes for the resource(s) in question . . ." <sup>19</sup> The NOAA Panel's concern about the implausibility of CVM responses essentially focuses on the fact that willingness-to-pay bids for specific environmental goods generally fail to consider the many other environmental goods which should, logically, receive similar bids by the respondents.<sup>20</sup>
3. "[R]elatively few applications of the CVM method have reminded respondents forcefully of the budget constraints under which all must operate . . ." <sup>21</sup> The NOAA Panel noted that, in answering CVM surveys, respondents "may respond without thinking carefully about how much disposable income they have available to allocate to all causes, public and private . . . . To date, relatively few CVM surveys have reminded respondents convincingly of the very real economic restraints within which spending decisions must be made."<sup>22</sup>
4. "[I]t is difficult in CVM surveys to provide adequate information to respondents about the policy or program for which values are being elicited and to be sure they

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18. As a general rule, the NOAA Panel explained:

"Common notions of rationality impose other requirements which are relevant in different contexts. Usually, though not always, it is reasonable to suppose that more of something regarded as good is better so long as an individual is not satiated. This is in general translated into a willingness to pay somewhat more for more of a good, as judged by the individual. Also, if marginal or incremental willingness to pay for additional amounts does decline with the amount already available, it is usually not reasonable to assume that it declines very abruptly."

*Id.* Therefore, in regard to the bird studies, the NOAA Panel observed:

"Diminishing marginal willingness to pay for additional protection could be expected to result in some drop. But a drop to zero, especially when the willingness to pay for the first 2,000 birds is certainly not trivial, is hard to explain as the expression of a consistent, rational set of choices."

*Id.*

19. *Id.*

20. *Id.* at 4604-5.

21. *Id.* at 4604.

22. *Id.* at 4605.

have absorbed and accepted this information as the basis for their responses . . . " <sup>23</sup> The NOAA Panel's concern regarding information adequacies went both to the amount of information given respondents prior to making a CVM bid and to the ability of the respondents to understand and incorporate that information into their decision making processes. <sup>24</sup>

5. "[I]n generating aggregate estimates using the CVM technique, it is sometimes difficult determining the 'extent of the market . . . '" <sup>25</sup> As the Panel opined, attempts at defining the relevant market for an environmental good may result in under sampling if there exist respondents outside the relevant geographic area who may hold some non-use or passive-use value for a given resource. <sup>26</sup>

6. "[R]espondents in CVM surveys may actually be expressing feelings about public spiritedness or the 'warm glow' of giving, rather than actual willingness-to-pay for the program in question . . . ." <sup>27</sup> As such, rather than being an effort at carefully attempting to ascertain a real personally held value, a CVM bid may, rather, be more akin to a charitable donation defined generally by the respondent's standard limit for such donations, i.e., \$10 to \$20. <sup>28</sup>

To a greater or lesser degree, at least some of these CVM flaws identified by the NOAA Panel are conceptually related to the embedding phenomenon--the "most important internal argument against the reliability of the CVM approach . . . ." <sup>29</sup> The NOAA Panel described the embedding phenomenon as follows:

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23. *Id.* at 4604.

24. *Id.* at 4605.

25. *Id.* at 4604. In reality, however, the definition of the extent of the market creates both under sampling and over valuation problems. That is, if the market is too broadly defined, the total assessment will, undoubtedly, pull in monetary bids from respondents whose relationship with the goods at issue is so attenuated that the validity of their stated value must be seriously questioned as merely an expression of an environmental attitude or "warm glow," as opposed to a legitimate and thoughtful valuation.

26. *Id.* at 4602.

27. *Id.*

28. *Id.* at 4605.

29. *Id.* at 4607.



Different but similar samples of respondents are asked about their willingness-to-pay for prevention of environmental damage scenarios that are identical except for their scale: different numbers of seabirds saved, different numbers of forest tracts preserved from logging, et cetera. It is reported that average willingness-to-pay is often substantial for the smallest scenario presented, but is then substantially independent of the size of the damage averted, rising slightly if at all for large changes in size.<sup>30</sup>

Thus, the effect of the embedding phenomenon, as identified by the NOAA Panel, raises serious questions concerning whether it is ever possible for CVM natural resource damage assessments to estimate, in any meaningful way, the monetary values respondents actually hold or attribute to the specific environmental goods.

Nonetheless, in an attempt to, at least in part, address these concerns, the NOAA Panel proposed a series of CVM guidelines. First, the NOAA Panel suggested that CVM surveys be conducted in accordance with a set of survey protocols generally applicable to survey research.<sup>31</sup> Second, the NOAA Panel provided a separate set of guidelines tailored to specifically address CVM natural resource damage surveys.<sup>32</sup>

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30. *Id.*

31. The general survey protocols suggested by the NOAA Panel include:

- (1) Appropriate selection of the sample type and adequate sample size;
- (2) Minimization of non-responses;
- (3) Conduct of survey in a personal interview format;
- (4) Incorporation of the results of previous studies of CVM results in order to avoid biasing interviewer effects;
- (5) Careful pretesting of the CVM questionnaire; and
- (6) Accurate and thorough reporting of the underlying protocols utilized in the CVM survey and the resulting analysis of the study.

*Id.* at 4608, 4611-12.

32. The panel's CVM-specific guidelines included:

- (1) Conservative survey design to avoid upwards bias and to increase trustworthiness of results;
- (2) The use of the elicitation format asking willingness-to-pay questions rather than willingness-to-accept questions, which tend to overestimate values;
- (3) The use of a referendum question format that asks respondent to vote for or against a particular level of taxation directed to the environmental good;
- (4) Providing the respondent with accurate information regarding the program or policy at issue to allow the respondent to make informed choices;
- (5) Pretesting of any photographs used as part of the survey and reminding the respondent of the existence of undamaged substitute

Even assuming the implementation of these two sets of guidelines, the Panel explained that the guidelines may not be enough to satisfy concerns about the general accuracy of CVM. Noting that CVM results are not subject to external validation because there are no other non-CVM methods which can quantify or capture non-use values, the Panel observed that "a problem arises because passive-use losses [non-use values] have few or no overt behavioral consequences. The faintness of the behavioral trail means that a well designed and adequately sensitive measuring instrument is needed to substitute for conventional observations of behavior."<sup>33</sup> As such, the Panel came back to the ultimate rhetorical query: "In particular, can the CVM method provide a sufficiently reliable estimate of total loss—including passive-use loss—to play a useful role in damage assessment?"<sup>34</sup>

Thus, the Panel opined that CVM-based natural resource damage assessments should be subject to traditional evidentiary rules with the offering party bearing the burden of proof.<sup>35</sup> Further, the NOAA Panel

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commodities that might affect the respondent's bids;

(6)Allowing for an adequate time lapse from the accident causing the environmental damage in order to permit the respondent to better evaluate the plausibility of restoration;

(7)The use of temporal averaging of responses elicited at different points in time in order to eliminate the effects of time-based bias;

(8)Provide respondent with a no answer option and ask the respondent to explain the choice;

(9)Inquiry into attitudes, such as general opinions about the environment, in order to interpret responses to bid questions; and

(10)Additional checks on the respondent's understanding and acceptance of the scenario.

*Id.* at 4608-09, 4612-13.

33. *Id.* at 4610.

34. With these reservations, the NOAA Panel concluded that "CV studies can produce estimates reliable enough to be the *starting point* of a judicial process of damage assessments, including lost passive-use values." *Id.* (emphasis supplied). Even then, the NOAA Panel suggested that while "a well-conducted CV study provides an adequately reliable benchmark to begin such arguments," the CVM results should be considered "in combination with other evidence, including the testimony of expert witnesses." *Id.* at 4611.

35. As the NOAA Panel stated:

Until such time as there is a set of reliable reference surveys, the burden of proof of reliability must rest on the survey designers. They must show through pretesting or other experiments that their survey does not suffer from the problems that these guidelines are intended to avoid. Specifically, if a CV survey suffered from any of the following maladies, we would judge its findings unreliable:

A high non-response rate to the entire survey instrument or to the valuation question.

Inadequate responsiveness to the scope of the environmental insult.

Lack of understanding of the task by the respondents.

cautioned that CVM based evidence could not be relied upon in isolation. Rather, at most, CVM results required independent verification through other forms of evidence before such results could be relied upon by a trier of fact. Accordingly, the Panel suggested "drastic reform of the CV procedure" prior to full acceptance of the method and its results as the basis for natural resource damage claims.<sup>36</sup>

Thus, given the depth of the Panel's concerns regarding CVM's inherent conceptual flaws, including the embedding phenomenon, the Panel's overall evaluation of CVM does not even rise to the level of "damning by faint praise." Further, even with the implementation of its proposed guidelines, it would be generous to conclude that the Panel was even guardedly optimistic that the suggested protocols would adequately address the embedding phenomenon and, accordingly, CVM's tenuous connection to the tenets of choice theory.

Nonetheless, apparently motivated by a desire to add the CVM arrow to its assessment quiver, NOAA disregarded the Panel's concerns and, instead, interpreted the Panel's report as a plan for regulatory action and CVM rulemaking. In response to the NOAA Panel, the NOAA rulemakers proposed a set of CVM protocols ostensibly designed to improve the reliability of CVM valuations and to, presumably, respond to the NOAA Panel's concerns regarding the embedding phenomenon.<sup>37</sup> In this effort to establish CVM protocols, NOAA emphasized three components of CVM studies: 1) Survey instrument design and development; 2) Survey administration; and 3) The analysis of the nature of the results.<sup>38</sup> Within those categories, NOAA suggested requirements for CVM assessments that, at a superficial level, might appear to counter the embedding phenomenon.

As to the survey design and development component, NOAA proposed, among others, the following protocols. First, NOAA recognized the importance of providing respondents with adequate information to make CVM bids. As such, NOAA assumed that, within the context of a brief survey contact, it is possible to provide respondents with adequate information to quickly solve problems that may stymie environmental regulators, lawyers, and scientists for years. As a further check on the

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Lack of belief in the full restoration scenario.

"Yes" or "no" votes on the hypothetical referendum that are not followed up or explained by making reference to the cost and/or the value of the program.

*Id.* at 4609.

36. *Id.* at 4609

37. National Oceanic and Atmospheric Administration, Natural Resource Damage Assessments, Notice of Proposed Rulemaking, 59 Fed. Reg. 1062 (1994) (proposed for codification at 15 C.F.R. pt. 990) [hereinafter NOAA Proposed Regulations].

38. *Id.* at 1143.

survey development process, the public trustee is required to determine, presumably through pre-testing of survey instruments, whether "respondents understood and found credible the description of the injuries . . . and the program for preventing injuries or restoring the natural resource" set out in the survey.<sup>39</sup>

Second, in order to ensure that CVM survey respondents maintain a rational financial context for their WTP bids, the NOAA *Proposed Regulations* require that respondents be reminded, both before and after the elicitation of their WTP bid, that "their WTP for the environmental program in question would reduce their expenditures on other goods."<sup>40</sup> As NOAA explained: "The goal is to induce respondents to keep in mind other likely expenditures, including those on other environmental goods, when evaluating the main scenario."<sup>41</sup> Likewise, where appropriate, it was the NOAA Panel's opinion that survey respondents should be reminded of "related natural resources that have not been injured by a discharge if such resources exist . . ."<sup>42</sup> in order to allow respondents to adjust their bids based on the existence of such substitute resources.

As to the survey administration components, although not actually requiring a particular mode of administering a CVM survey, after extensive discussion of the three primary modes of survey administration—in-person, mail, and telephone—NOAA strongly suggested that CVM surveys be conducted through in-person interviews.<sup>43</sup> As NOAA explained its preference for in-person interviews:

A CVM survey designed for natural resource damage assessment purposes is likely to impart a large amount of information to respondents causing interviews to be lengthy and often complex. In-person interviews offer the opportunity to motivate the respondents and to hold their interest by providing important information in a graphical and pictorial format and asking interactive questions regarding the respondent's understanding and acceptance of key features of the instrument. It also permits the interviewers to record verbatim responses to important open-ended questions. Such informa-

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39. NOAA *Proposed Regulation*, *supra* note 37 at 1083, (proposed for codification at 15 C.F.R. § 990.78(b)(5)(B)).

40. *Id.* at 1183 (proposed for codification at 15 C.F.R. § 990.78(b)(5)(i)(C)).

41. *Id.*

42. *Id.* at 1158. *See id.* at 1184, (proposed for codification at 15 C.F.R. § 990.79(c)) (requiring consideration of substitute alternative resources and/or services when calculating compensable values).

43. *Id.* at 1183, (proposed for codification at 15 C.F.R. § 990.78(b)(5)(ii)(B)); (stating no preference for mode); *id.* at 1144 (stating preference for in-person interviews).

tion may be critical in demonstrating that the trustee(s) has adhered to the regulatory standards proposed by NOAA.<sup>44</sup>

NOAA also proposed several methods to analyze the nature of CVM surveys results in order to assess their validity and reliability. These methods, which ostensibly bear upon the embedding phenomenon, include sensitivity testing through the use of parallel surveys and the calibration discounting of CVM results to produce a more conservative damage figure to account for CVM's inherent biases.

In order to counter the NOAA Panel's concern that CVM bids represent a pro-environmental vote as opposed to an actual valuation of the specific commodity at issue,<sup>45</sup> the *NOAA Proposed Regulations* set forth an internal validation system—as opposed to *external* validation—for CVM surveys which requires the public trustee to conduct two separate validation surveys in which the dimensions of the injury at issue are either scaled up or scaled down from the level of the actual injury at issue. The results of the validation surveys are then to be compared to the results of the primary survey to determine if the responses validation surveys and the primary survey demonstrate sufficient sensitivity to the differences in the scope of the injuries.<sup>46</sup> NOAA explained that, "the scenarios may vary along any of the margins of intensity, geography, and duration of damage, and for prevention scenarios, the probability of an event occurring."<sup>47</sup>

In addition, to counter the numerous potential biases identified by the NOAA Panel, NOAA proposed a crude method by which to discount CVM valuations. To meet the biases of concern and in furtherance of NOAA's general CVM policy encouraging conservative procedures,<sup>48</sup> the proposed regulations require that CVM results be discount-

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44. *Id.* at 1144. Regardless of which mode is selected, NOAA requires that the survey shall be administered by an experienced survey research organization. *Id.* at 1183 (proposed for codification at 15 C.F.R. § 990.78(b)(5)(ii)(B)(3)).

45. See NOAA Report, notes 27-28 and accompanying text.

46. *NOAA Proposed Regulations*, *supra* note 27, at 1183, (proposed 15 C.F.R. § 990.78(b)(5)-(iii)); *id.* at 1145-46. In designing the alternative scenarios, the public trustee must avoid scenario differences that are so large that variations in results would be a "foregone conclusion." As such, "[p]rior to performance of the test, the trustee(s) shall demonstrate that not more than ninety-five percent of respondents in a pre-test or in focus groups indicate that there are meaningful value differences between the scenarios to be tested in any pair-wise comparison." *Id.* at 1183, (proposed for codification at 15 C.F.R. § 990.78(b)(5)(iii)(c)); *Id.* at 1146.

47. *Id.* at 1183, (proposed for codification at 15 C.F.R. § 990.78(b)(5)(iii)(B)).

48. *Id.* at 1146-47. In addition to calibration and discounting, NOAA suggested that other conservative measures be employed, such as requiring lump sum versus installment payments for WTP bids and avoiding the use of shocking photographs, such as of dead sea otters, which might tend to inflate or prejudice results. *Id.*

ed by 50 percent in order to account for these biases, unless the trustee can demonstrate why a different calibration factor is appropriate for given CVM study.<sup>49</sup>

Interestingly, despite the significant efforts demonstrated by NOAA in its formulation and explanation of its proposed CVM protocols, nowhere in NOAA's preamble discussion is there any reference to the embedding phenomenon or how the proposed protocols might serve to counteract the phenomenon. Instead, the only reference to embedding is in NOAA's response to comments where the agency simply stated that "NOAA agrees with the commentators who believe that alleged biases in CVM responses resulting from the embedding phenomenon can be avoided through careful questionnaire design and execution of the survey."<sup>50</sup> However, as discussed in the next section, the authors assert that the proposed NOAA protocols do not adequately address the embedding phenomenon, and that embedding continues to present a very real and substantial flaw in CVM studies and in the accuracy of any damage claims derived from such studies.

### III. THE EMBEDDING PHENOMENON IN THE ECONOMIC CONTEXT

Despite the elaborate procedures proposed by NOAA, the issue of embedding remains a potential problem in evaluating CVM results. Consider the following survey results, reported in Binger, Copple, and Hoffman.<sup>51</sup> A survey satisfying most of the proposed NOAA protocols<sup>52</sup> was designed to elicit, from residents of the Rocky Mountain states, willingness-to-pay to avoid a 1 percent timber harvest in the Selway Bitterroot Wilderness Area of Idaho. Respondents were asked to express their WTP to prevent the timber harvest in four different surveys.

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49. *Id.* at 1183 (proposed for codification at 15 C.F.R. § 990.78(b)(5)(i)(D)(4)). Curiously, the NOAA Proposed Regulations, *supra* note 37, refer to this discounting process as "calibration." Traditionally, in the context of any technical modelling process, "calibration" refers to the adjustment or fine-tuning of a model to ensure *internal* consistency. "Validation" is the process by which model results are compared with real data to ensure *external* consistency. The NOAA discounting requirement is neither, but instead a crude method to, in some sort of wholesale way, attempt to mitigate the inherent biases and inaccuracies presented by CVM valuations. As such, the 50% discount "calibration" requirement is virtually an admission by NOAA of the inadequacy of CVM as a natural resource damage assessment tool.

50. *Id.* at 1160.

51. Binger, Copple, & Hoffman, *supra* note 3, § III.

52. Despite the fact that the embedding study was conducted prior to the publication of the proposed NOAA protocols, the study satisfied all of the relevant protocols with the exception that telephone interviews, rather than in-person interviews, were employed.

The variations in the four surveys that are crucial to this analysis of CVM reliability and accuracy can be summarized as:

Survey A: Respondents were asked how much their *households* were willing to pay to prevent a timber harvest in the Selway Bitterroot Wilderness.<sup>53</sup>

Survey B: Respondents were asked how much they as *individuals* were willing to pay to prevent a timber harvest in the Selway Bitterroot Wilderness.<sup>54</sup>

Survey C: Respondents were first given the information that there are fifty-seven wilderness areas in the states of Colorado, Idaho, Montana, and Wyoming, and then asked how much their *households* were willing to pay to prevent a timber harvest in just the Selway Bitterroot wilderness. After responding to the first question, they were asked how much more they were willing to pay to prevent the harvest in the other fifty-six wilderness areas.<sup>55</sup>

Survey D: Respondents were first asked how much their *households* were willing to pay to prevent a timber harvest in all fifty-seven wilderness areas. After responding to the first question, they were asked how much of that amount they would like to see designated specifically to prevent the timber harvest in the Selway Bitterroot Wilderness.<sup>56</sup>

Surveys A and B address the question of whether respondents distinguish between individual (1 person) and household (several people) WTP. Surveys A and C address the question of whether WTP changes when respondents are reminded of other possible environmental goods that might compete for their contributions. Surveys A and D address the classic embedding problem.<sup>57</sup>

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53. Brian Binger & Elizabeth Hoffman, Selway Bitterroot Wilderness Study Survey A (1991) (on file with authors Binger and Hoffman) [hereinafter Survey A].

54. Brian Binger & Elizabeth Hoffman, Selway Bitterroot Wilderness Study Survey B (1991) (on file with authors Binger and Hoffman) [hereinafter Survey B].

55. Brian Binger & Elizabeth Hoffman, Selway Bitterroot Wilderness Study Survey C (1991) (on file with authors Binger and Hoffman) [hereinafter Survey C].

56. Brian Binger & Elizabeth Hoffman, Selway Bitterroot Wilderness Study Survey D (1991) (on file with authors Binger and Hoffman) [hereinafter Survey D].

57. It is not clear that it is possible to ever know fully the sources of the embedding phenomenon. However, one potential source comes from the "warm glow" associated with a real or hypothetical indicated willingness to pay for almost any "good cause," as identified by the NOAA Panel. See NOAA Report, *supra* notes 27-28 and accompanying text. Suppose, for example, an individual were to routinely respond with \$10 or \$20 to a request for a contribution to anything which sounds like it is remotely worthwhile. This would quite readily generate the embedding result: The first category of "cause" presented to a

The results illustrate fundamental inconsistencies inherent in CVM methodology. Responses to surveys A and B are not significantly different from one another, suggesting that respondents do not distinguish between individual and household WTP, even though WTP of more than one person should, in principle, be larger than individual WTP. Responses to surveys A and C are also not significantly different, suggesting that respondents' bids are not affected by reminding them of substitute commodities. However, the differences in the responses to surveys A and D are significant. In survey A, where respondents are asked only for their WTP for the individual site, the median response is \$10. In survey D, when respondents are first asked for their WTP for all 57 sites and then asked to designate an amount for the individual site, the median falls to \$2. This is a classic example of the problem of embedding.

Additionally, the variation in results from these surveys would leave a trustee with a significant question regarding which, if any, of the WTP values for preventing a 1 percent timber harvest in the Selway Bitterroot Wilderness area to adopt. Should it be a median individual WTP of \$10 from Surveys A or C; a median household WTP of \$5, divided by mean household size to estimate an individual WTP of between \$1 and \$2 from Survey B; or a median individual WTP of \$2 from Survey D? If the population of over 5 million in the Rocky Mountains is deemed applicable, this implies damage estimates ranging from around \$5 million to over \$50 million. Yet, there is no guidance in either the NOAA protocols or the CVM literature regarding which estimate is acceptable. Moreover, there is no apparent scientific evidence to support one estimate over another.

This is a striking example of the continued existence of the embedding problem, even when care is taken to adhere to the recommended procedures. While we recognize that some CVM studies which follow NOAA protocols might yield a set of internally consistent

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respondent receives the routine response. If that is also the final category, then the entire amount is allocated to it. However, if the first category is subdivided and the respondent is asked to allocate the first amount among the subcategories, then the likelihood is that the amount allocated to the target category will be substantially smaller than when inquired about individually. Obviously, the more levels of subdivision which occur, the smaller will be the resulting final WTP estimate. This discussion clearly suggests that if responses are even partly generated according to the above scenario, the results cannot be thought of as "well-considered" calculations. As an alternative hypothesis related to the warm glow effect, though somewhat less generous in human terms, it is possible that, when posed with a CVM survey, respondents provide a standard or "pat" bid, not out of a sense of charity or duty, but, instead, to placate the interviewer and bring the interview to a quick and painless end. Of course, however, further research is required to determine the existence of, what we shall call, the "get out of my face" or "interview avoidance" effect.



estimates, we do not share NOAA's faith that following those protocols will generally demonstrate such internal consistency. Moreover, the search for such consistency essentially constitutes a one-tailed test: when inconsistencies such as those in the survey discussed above are present, there is clearly a problem in interpreting the results; but even if following the protocols does not result in inconsistencies, there is still no reason to believe that the indicated result should be relied upon as being correct; that is, as *externally* valid.

The fundamental problem with the NOAA protocols is that they suggest that adhering to them lends scientific credibility to the resulting CVM estimates. Yet, there is virtually no external validity attached to that claim. First, the 50 percent discounting rule is apparently based on one study<sup>58</sup> that has never been replicated either using the same or different conditions. As a general rule, scientists do not accept test results as conclusive evidence without many replications by independent researchers. Moreover, a study of hypothetical and real WTP for environmentally friendly electricity found a 8- to 10-fold difference between hypothetical and real WTP<sup>59</sup>. This one other study suggests, at a minimum, that the 50 percent rule should not apply to all environmental commodities. And, since each commodity is unique, how is the trustee to decide which study to adopt as a guide?

#### IV. CONCLUSION

What is particularly interesting about the regulatory treatment of CVM is that it represents an agency application of the old entrepreneurial principle: "If you can't fix it, get a bigger hammer" or, any problem can be solved if you dedicate enough effort to it. Although this article is not intended to be the ultimate criticism of CVM, the authors assert that CVM may likely prove to simply be too flawed to serve as a basis for natural resource damage claims. That is, despite NOAA's marked enthusiasm for working CVM into the natural resource damage assessment process (in contrast to the NOAA Panel's lukewarm evaluation of CVM), the fundamental problems presented by CVM may simply prove to be unfixable. At the very least, CVM is still largely in an embryonic state of development. Thus, CVM should not be forced into regulatory service until the method is fully developed and, more importantly, until we better understand how, whether at all, CVM is actually linked to the *real values* that citizens place on environmental goods. Therefore, at least

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58. Donald L. Coursey et al., *On the Disparity Between Willingness to Accept and Willingness to Pay Measures of Value*, 102 Q.J. Econ. 679 (1987).

59. Brian Byrnes et al., *Talk is Cheap: Electric Customer Willingness to Pay for Environmental Commodities* (forthcoming).

at this stage of CVM research, natural resource damage defendants should not be subjected to damage claims based on such an undeveloped method with all of its underlying uncertainties.

At best, the NOAA protocols represent a stop gap attempt at a somewhat superficial level to address *some* of the concerns regarding CVM reliability. There is, however, a fundamental question which NOAA has not yet answered concerning whether the problems presented by CVM (indeed, NOAA has not even adequately identified those problems) can be fixed or are so deeply ingrained in the method that CVM, at least in the natural resource damages context, is fatally flawed. As such, there is serious doubt whether the NOAA protocols concerning either sensitivity testing or calibration address these inherent flaws. For example, as to the "calibration" or "discounting" of survey results, there is a question whether such flaws can be remedied by mandating reduction of survey-derived valuations by some seemingly arbitrary factor. It is a long-standing and well accepted principle that 50 percent of nonsense is still nonsense. Similarly, as to NOAA's protocols for sensitivity testing, such testing can only be meaningful for designing and fine-tuning survey instruments based on a *reliable* method. As such, sensitivity testing is meaningless without this underlying reliability. Likewise, the same concerns about inherent CVM flaws applies to the general social science survey protocols proposed by NOAA. The application of such procedures can only enhance the accuracy of survey results based on otherwise accurate economic or social science methods. In all, discounting, sensitivity testing, and survey procedures applied at the end of the CVM process cannot cure or compensate for methodological flaws that are inherent in the basic foundation of CVM.

As demonstrated by the authors' research concerning the embedding phenomenon, CVM cannot reasonably be characterized as an accepted, reliable, or trustworthy method. Instead, the embedding phenomenon demonstrates that CVM is too inherently flawed to use as a valuation technique in natural resource damage actions. Further, there is no reason to conclude that the embedding phenomenon is the only serious flaw presented by CVM. On the contrary, along with the fact that it is impossible to externally validate CVM results, it is more likely than not that other serious flaws are inextricable or unfixable aspects of the method. As such, federal and state agencies should, as a function of their duty to the public interest, tread carefully when reviewing and endorsing natural resource damage valuation methods. Accordingly, NOAA and DOI should recognize CVM for what it is and to refuse to sponsor its application.